



DCV or DIESEL?

Text and Photos
by Charles K Chiodi

The Conser 47 high-performance catamaran, Split Second, leaving the Miami Boat Show for sea trials.

Split Second, the latest catamaran with an Electric Motor installation for propulsion passed us on the way out of Miami, both on sea trials. I was testing *Rhapsody*, a Seawind 1200, the first to arrive in the United States, but *Split Second* already had a few thousand miles under her keel – as a powerboat!

A powerboat?

Well, not quite by design, but by circumstance. Somewhere between the designer and the riggers the numbers got fuzzy, the stays were the wrong size and the mast nearly fell down. Oh, how nervewracking! But, the owners, Don and Ann Poyas, were determined to cruise with their new catamaran, so they did just that until the new (and proper) rig was installed. They are both Coast Guard-licensed captains and own a charter company in California.

I mention this because it has a bearing on some critics' views.

And there are some. A few naysayers and doubting Thomases made me curious enough to drive to Benedict, MD, about 500 miles south of Boston, to see and test the oh-so-controversial Electric Wheel. One electrical engineer warned me: "Consider (that) the credibility of your magazine is at stake here. Does advertising income steer editorial content?"

The answer is a strong NO!

Because our quest for the new, innovative, even avant garde ideas, we published two articles about the

Electric Wheel, a year-and-a-half apart, without even hinting at advertising.

It was a thunderstorm-filled day driving to Maryland, but the weather cleared up for the following day's test on the Chesapeake. *Split Second* was berthed at a marina in Solomons where the Patuxent River widens and enters the Chesapeake Bay.

The first sign of being on an unusual boat was the stare from those standing on the dock, admiring this sleek-looking catamaran. Don and David (Tether) untied the dock lines and the boat moved away, accelerated, and soon was in mid-channel traveling about 6 knots toward the wide opening on the horizon. The mainsail was still under the cover, the genoa furled, yet we were moving fast, hardly making any wake. I was furiously snapping away with my camera at a bird nest atop a channel marker that was a good 100 yards away, and announced that the photo will be a prominent part of my report.

"How so?" I was asked by those aboard. I grinned. Then I pointed to the small beaks reaching up.

"Listen" – I said. "Can you hear the chicks in the nest chirp for food?"

"Yes, but what's your point?"

"We are moving now better than 6 knots – *under power* – and we can hear the birds. We are talking and not shouting to each other as we

would if we had two diesels instead of two electric motors under us. That's my point."

That explains the surprise of the bystanders standing on the dock who had seen the boat move silently, without the sails up.





Silence is not the only benefit of this installation, although our comprehensive test with a sound meter showed surprising results (see sound diagram).

The Installation is simple and clean. To the left are photographs of the motor's position in the bilge, under the stateroom floor (identical in both hulls of the catamaran), together with the battery banks supplying the energy. The 10 KW generator is located in another part of the boat and is so well insulated, that one needs to look at the electric meter to see if it is *on!*

What about Weight? Multihulls are notorious for weight consciousness. Two ST 74 dual motors in this catamaran weigh 266 lbs, including the controller box. Ten batteries weigh 1,350 lbs. and the heavy-duty wiring adds 60 lbs. for a total installation of 1,676 lbs.

Two 27 HP Yamaha diesels with gear, exhaust, fuel lines and filters (called for in the original design) weigh 900 lbs. Two full 50-gallon diesel fuel tanks weigh 830 lbs. Add a 50-lbs. starter battery for a total weight of 1,780 lbs. The electric installation is about 100 lbs lighter!

The Cost is Higher. Currently a system installation such as on *Split Second* costs \$28,191 as opposed to \$23,824 for the diesel engines. As in everything new, the Electric installation is more expensive. The price should come down as more units are sold.

The Unique Features of the electric motors are:

1. Instant Power. We did not need to idle at the dock, waiting for the diesel to "warm up" before engaging the gearbox. We just turned the key and left.

2. Instant Reverse. In a panic situation, such as on a collision course with another vessel, or the dock, this may be a "lifesaver." During my test, we put the motors from full forward into full reverse and the boat stopped in 1.5 boat length. Then started moving backwards at about 3/4 of its forward speed. There was no sound of grinding gears, because there are no gears.

3. No Fumes. I stood on the lowest step of the transom where you normally inhale the diesel exhaust, but of course, there was none!

4. No Vibration. Who needs it, anyway. Want “smooth sailing?” How about “smooth motoring?”

5. Low Maintenance. With only 8 moving parts, less can wear out. No oil and filter changes, no contaminated fuel worries, no messy bilges.

6. Regenerating Energy. The boat is motorsailing – most of the time. With the apparent wind increased, the performance is also increased. When the sailing speed surpasses the motoring speed and the propellers are free-wheeling, they start feeding energy back into the batteries. The same happens when the boat is surfing on a wave. Or sits on a mooring, and a current is running. Regeneration may happen for a few minutes, or for hours. Theoretically – and it actually happened a few times – the boat can come home with more energy stored in the batteries than she had at departure.

I must admit, that the ultimate test would be to motor into a 35-knot headwind and a 5-knot current, which I could not do that day. I have to take Don and Ann Poyas’ and David Tether’s word for it. They did have very rough conditions last May on the way home from the Miami Boat Show to *Split Second’s* temporary home in the Solomons.

Another test I would have liked to conduct, but could not, would have been a long passage in total calm (perhaps in the Sargasso Sea) to determine how the batteries would fair when there is no natural regeneration.

I am convinced enough of the Electric Motors’ merits that I would not hesitate to install them in my own boat. Since I can’t do that (because I don’t have one), next best thing was to talk to those who did just that. A conversation with John Curtis of Nicascio, California (916-806-4327) revealed that he

changed from a Honda outboard motor that was the auxiliary power on his 35’ Piver Lodestar trimaran, to an Electric Motor and renamed the boat *Silent Running*. He uses the boat daily and loves the installation. When I asked him if there is anything that he would like to improve on, he said that the old-technology lead/acid batteries should be “reinvented in another form” to keep up with modern demands, while Solomon Technologies’ complaints are directed toward the inferiority of generators.

Like all the other critics, I also had the misconception that a 6 HP Electric Motor could not provide the power of a 27 HP Yanmar diesel, but it seems that *torque* is the key word, not horsepower.

I suggest to those who are still skeptical to come to a boat show and face these people whose claims they don’t believe.



Continuous duty brushless DC permanent magnet (Nd Fe B) the ST 37 is a single motor that develops six nominal horsepowers @1200 rpm (4.5 kw). Input is 144 vdc, with full load amperage is at 32. Torque 37 lb/ft. Weight 98 lb. Size 13”x13”. Housing is totally enclosed, non-ventilated.



Continuous duty brushless DC permanent magnet (Nd Fe B) the ST 74 is a twin motor that develops 12 nominal horsepowers @1100 rpm (9 kw). Input is 120/144 vdc, with full load amperage at 80/90. Torque 74 lb/ft. Weight 133 lb. Size 13”x17”. Housing is totally enclosed, non-ventilated.

TEST	IN COCKPIT	IN SALOON	IN BERTH	IN ENGINE RM
Engines on, full fwd	65 DB	63 DB	68 DB	77 DB
Engines on, full fwd, generator on	71 DB	66 DB	72 DB	77 DB
Sailing, no machinery on	73 DB	66 DB	67 DB	74 DB
Sailing, <i>and</i> engines on	74 DB	66 DB	69 DB	75 DB
Re-generating 5-7 amps @ 137 vdc (685-959 watts)				

The test was conducted in 13 knots of wind. Sailing speed was 7.5 knots, motoring speed was 7.5 knots against a 2-knot tide. The generator is 10 KW. There is no insulation in the engine or generator rooms. An additional generator noise level data point was taken with *hatch open and 3 feet* from the generator. That noise level was 94 DB. With the boat dead in the water, the ambient noise from the wind blowing was 62 DB.

"There is magic in beginnings and it is this magic that sustains us through life"

An article by Susan Caumont

Talking to boaters at the Miami Boat Show '02 as they came aboard *Split Second*, it became clear that they are looking for alternatives to fossil fuel propulsion. Their reasons vary from noise of the engines and smell of the diesel, the poisoning of the waterways and air, as well as to conservation.

Solomon Technologies has been performing power change operations for 7 years, with the added benefit of regeneration. This nifty innovation was the brainchild of Dave Thether CEO, sparked by his buddy, "\$600 John," a junkyard inventor. John had observed that the sun and ring of the permanent magnet motor could rotate independently of each other performing infinitely variable functions. John saw applications for gears. Dave saw energy regeneration under sail. He calls this system The Electric Wheel. The freewheeling of the prop in the water while a boat is under sail is effectively translated to energy and stored in a battery bank. Dave tested the Wheel on his own sailboat and was shocked when it performed beyond his expectations.

While visiting on the sailboat, *Sea Otter*, arguably the best monohull at the show, my friend Jeff brought up the subject of electric propulsion. The owner/builder insisted that he was too old-fashioned to change. As we were leaving I noticed a framed quote, in German, from the author Herman Hesse and asked for a translation. "There is magic in beginnings and it is this magic that sustains us through life."

Dave Thether, the inventor of the wheel, so to speak, is a sandy haired fellow who leans forward with curiosity and intensity while conversing. But what makes him tick? As you might expect of a man who named his company after an ancient philosopher who got lucky and made an impact with sensible ideas, Dave's imagination is stimulated

by ecological and conservation concerns. He wants to make a living not a killing. He accepts responsibility for his impact upon future generation's attitude and the environmental state of the earth. Aided by the excellent salesmanship and tact of John Finnerty and the rest of his well-informed and talented staff, Dave is creating a business with a conscience. The Electric Wheel is the most fuel-efficient means of marine propulsion on the market.

Dave's friend, John Conser, who has designed catamarans for 25 years and was a sailmaker for 35, says his major motivating factor for putting *only* electric propulsion in his new cats is his new granddaughter. He will do anything to make sure the world is better for her, ecologically and economically. The surge of pride and admiration for a new life that overtakes the minds of grandparents has lifted John Conser to a new sense of world stewardship and he feels the conservation of fossil fuel is a step in the right direction.

Don and Ann Poyas agreed to be test mice. Ann, whose sensitivity to fossil diesel smells and loud engine noise was key in the decision to have their new Conser 47 outfitted with electric motors, is a charming animated woman who has honed her exceptional onboard cooking skills during the years she and her husband have chartered on the West Coast. Their beautiful monohull, *Althea*, is another story altogether. Sporting a figurehead of a gorgeous female, this cutter-rigged sailboat is a teak and canvas fantasy of sailing the ocean blue. Aboard her catamaran Ann's enthusiasm for her quiet, clean [the white glove treatment would not be out of place here] energy source is unbounded. She proudly displays the motors, immaculately ensconced in each hull, exclaiming, "I love it!"

Don, who has sailed since he was a boy, also loves the motors, but for other reasons. Quick stopping [two boat lengths at 12 to 14 knots to a full stop] fuel efficiency and energy regeneration under sail with the Electric Wheel.

Another important ingredient in this mix is the type of fuel. The efficient genset that keeps the batteries charged, provides a way to use less fossil fuel, but what if you make part of your liquid fuel biodiesel? Jeff Beller, referred to as a renewable energy evangelist, saw a light go on in his head when he heard about the Solomon Tech ideas. He soon became aware of Ann and Don's electric cat. "This can be even better if they use biodiesel in the genset," he said. Jeff has been an advocate for sun, wind and biomass fuels for 20 years. Biodiesel is a liquid fuel made from soybean oil or waste greases from the fast food industry. It is a waterway and air-friendly fuel made in the USA. All engines are warranted at 20% biodiesel 80% fossil fuel, but Mercedes makes an engine that can run on 100% biofuel. Even at 20% the benefit to the water is less harmful discharges, less harm to the air quality and significantly less diesel fuel smell. There is less fuel use with the electric motors and with the biodiesel additive what is being used is cleaner. "Fishermen should be very interested in this. They won't sacrifice speed and they won't sacrifice fish to water contamination by fossil fuel," says Jeff Beller.

John Conser from now on refuses to install diesel engines in his cats, only electric motors will propel his boats. "This won't be the perfect boat for everyone, and I know that, but for a certain group it will be just right," says Conser. Ann Poyas agrees and adds: "the birth of a boat is like childbirth, you forget all the bad things after you are holding the baby in your arms."