

UNPLUGGED



An upgraded on-board power supply provides freedom from shore power and a respite from noisy generators.

BY BROOKE C. WILLIAMS

Anyone who lives aboard a boat — or spends a significant amount of time aboard — understands the dilemmas posed by on-board power requirements. When plugged in at the dock with seemingly unlimited power available, we can enjoy all the creature comforts of a house. This often tempts us to bring a host of power-hungry equipment on board. But once we pull away from that dock, the tables turn.

All on-board appliances and equipment demands must be met by the finite reserves of a battery bank or a generator. I do not need to overemphasize the challenges of living within the means of house batteries — or of sizing, loading and maintaining generators on small boats. Anyone who has been there understands.

Some say boats have become too complicated. Proponents of the back-to-basics theory of operation feel the best solution to on-board power management is to simplify — stripping back the amount and complexity of on-board equipment to reduce generator power demands and maintenance issues.

MILES AWAY from shore power, East Passage sits at anchor in George Town, Bahamas (left). The Fischer Panda DC generator (top).

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QUIET MORNINGS in places such as Canada's Rideau Canal (top) can now be enjoyed without the intrusive sound of a large generator. *East Passage*, under way near Baltimore (above center), couples alternators to a pair of Victron inverters to meet AC needs (above).

Speaking as folks who have lived aboard for more than six years, my wife Dee and I don't subscribe to that minimalist approach. Doing so would mean sacrificing the comforts of home, which we are not willing to do. On the other hand, we have simplified our power supply

system and at the same time made it more flexible and efficient. But we did so not by removing equipment but by adding on. Therein lies our story.

Our boat, *East Passage*, is a Mirage Great Harbour 47, built in 2004 and equipped to enable the live-aboard lifestyle we wish to maintain. As such, it is outfitted with an array of household appliances and amenities that most people living in a small apartment would find quite adequate. We have a household refrigerator, microwave, dishwasher, washing machine, four-element ceramic cook stove and a half-chest freezer, as well as 220-volt equipment that includes three AC units, a watermaker, a clothes drier and a dive tank air compressor.

Though the boat was fitted with a large (1,140 ampere-hour) battery bank, the 220-volt equipment we carry often required us to run the 12.5 kW Westerbeke generator when we were off the dock. For those who spend considerable time at marinas, this might not be an issue. But for us, the cruising lifestyle is all about being on the water as often as possible, away from docks with cameras in hand. On a cruise to Maine in the summer of 2009, we didn't go to a dock with power from mid-June to early October. This past summer, during a Canadian swing, we were anchored or tied to dock walls without power three-quarters of the time.

The Maine trip turned out to be double trouble, as we asked our generator to do more with less. We had failing batteries, which meant the generator ran more often than usual. I envy those with smooth, quiet generators. Our Westerbeke is noisy and transmits substantial vibration, creating a direct attack on our desired at-home lifestyle.

Clearly, we needed new batteries. After a series of conversations with our boatbuilder and the naval architect who designed *East Passage*, we decided to go beyond

replacement and invest in an entirely new power supply package. Ken Fickett of Mirage Manufacturing told us of the great success he had installing and refitting his boats with twin Victron pure sine wave inverters. The advantages of this arrangement are redundancy and the ability to run 220-volt equipment from the battery bank without starting the generator. We were convinced and decided to add twin inverters when replacing the battery bank.

Then came a chance conversation with Lou Codega, the designer of Mirage boats. A mention of Steyr engines evolved into a discussion about generators. In my mind, the Steyr system, which couples both a diesel engine and an electric flywheel to the transmission and prop shaft, essentially has a variable speed DC generator at its heart. Codega allowed me this technical transgression, commenting that a Steyr system can't be so simply described and mentioned the availability of variable speed, efficient DC generators.

The proverbial light bulb went off, and in pretty quick order, Codega, Fickett and I were all on the Internet looking at DC generator packages. We started talking with someone at Fischer Panda who helped size a DC generator to our needs: a 4.5 kW Panda AGT-DC 5000 PMS with 12-volt output. The purpose of this new unit would be to provide DC power for battery charging and for the inverters.

Installation of new batteries, new inverters and a new generator was tedious but without significant issues. So rather than laboring over the details, I will concentrate on how this new power package fits together. We kept the

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Westerbeke but now use the Fischer Panda as our primary generator and utilize our battery banks for more of our ongoing power requirements.

We found the Fischer Panda to be a powerful battery charger, pumping out 230 to 240 amps and maintaining a high rate of charge throughout the charging cycle. Battery chargers are typically set up to provide a high charge for a limited period of time.

They then step down to moderate charge and finally to minimal charge. The timing of these charge cycles is programmed into inverter chargers. By not being locked into this type of timed charging reduction, the new genset gives us more charging power for longer. When we need to run equipment that requires more amperage than the batteries should support, we turn on the DC genset and let its charge pass directly to the inverters. If the draw is less than the genset's output, the excess is used to recharge the battery bank. If the load exceeds generator output, the difference is drawn from the batteries.

This system works remarkably well for our normal daily needs. Using inverted DC genset voltage, we can run any of the following equipment separately: two burners on the electric stovetop, one 220-amp air conditioning/heating unit, the 220-volt watermaker, the 220-volt clothes dryer or the 220-volt hot water heater. The bonus to using a variable-speed genset is not worrying about load management. If the power draw is marginally more power than the batteries can provide, the Fischer Panda runs comfortably with minimal load. This is so much simpler and so much more flexible than using our AC genset.

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If we do need to run high-load equipment, the big Westerbeke genset must run, but this is a rare requirement for us. From mid-May to late October, that big genset has run for power purposes only four times.

We avoid high-demand equipment cycles by adjusting our power usage routine but never at the expense of our out-on-the-water lifestyle. We simply don't need to do everything at once. If anything, this equipment shift has made life more relaxed, as we now do more chores while under way. The twin Victron inverters allow us to invert alternator output to 220-volt power. We have always been reluctant to run a genset lightly loaded under way to support equipment usage. Now when running, we can cook, run one AC unit, do laundry or make water off a combination of batteries and alternators without any supporting genset.

The AC units and the watermaker do ask for more power than our alternators supply. This has never presented a problem as we monitor battery draw — one of the few times we ever need to actively manage power usage. We simply pick a battery draw-down cut-off point for this equipment usage or fire up the DC genset at that point. Additionally, we now make water only while under way and out in open water, rather than debating the advisability of using the watermaker in some of the mud holes where we anchor.

Since the addition of the Fisher Panda, total generator hours are down by one-third, using a generator that's output is about one-third of our big unit. Moreover,

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those generator hours are less intrusive. The Fischer Panda will barely meet our decibel meter's minimum recording threshold, and its exhaust is totally silent.

As sweet as the Fischer Panda generator is, the real key to the success of our upgrades is the addition of the two Victron inverters. Having a system that brings a 110-volt line into a dedicated inverter and that can output 110 volts from each of the two inverters has multiple benefits. If a boater uses an AC generator there are no more concerns over an unbalanced draw on each leg out from the genset. Instead of one leg supporting the charger, the system now has two chargers operating. Our inverters will max out at 180 amps when charging into the batteries.

With Victron equipment, switching from generator power or shore power to inverted power and back is absolutely seamless. I have an old computer that just loves to shut down with the slightest hiccup in power — no more. These inverters will automatically reduce their charging rate if high inverted power usage is required. No more dialing in a set power/charging ratio and then living with the probable inadequacies of both values. Additionally, the inverters will automatically, instantly and continuously draw from the batteries up to the capacity of the inverters if loads exceed the AC power feed.

What happens when the batteries run down? The inverters can be set to autostart a generator at low voltage or high amperage thresholds. Add in an Iota switch, a device common to the RV industry, and the inverters

are directed to make switches automatically. We have the Westerbeke set up for high amp autostart (never used) and low state-of-charge battery threshold using Victron's battery monitor calculations. Using SOC for Fischer Panda charging has proved to be about as set-it-and-forget-it as I can imagine.

So far, there have been precious few hiccups in the operation of this system. We did have an issue with the Fischer Panda's battery monitor that could not be solved by telephone troubleshooting. Fischer Panda sent its top technology representative to investigate the issue and we wound up using Victron's battery monitor for its SOC capabilities.

At one point, the genset was shutting down due to air in the line. Fischer Panda paid for a mechanic to investigate. He could find nothing wrong and speculated that, as illogical as it sounded to him, our use of a much larger fuel filter than normal could be an issue. I checked and found the fuel level in the filter to be low, so I bled the filter instead of engine fittings I had previously cracked — problem solved. We have only had a couple of technical questions for Victron. Otherwise, nothing else has gone wrong. We are happy cruisers.

Yes, this upgrade hit our pocket book quite hard. And yes, we do monitor our usage — but much more passively than previously. That leads us back to lifestyle. This boat is our home and we expect the boat to support us accordingly whether on or off a dock. A big battery bank gives us reasonable periods of time when we can draw from just the batteries. The combination of inverted

About the Authors



Brooke and Dee Williams have been full-time cruisers aboard their *Mirage Great Harbour 47, East Passage*, since July 2004.



Brooke is a lifelong boater from east North Carolina whose first boat was one of the earliest fiberglass runabouts powered by a 7.5 hp motor. He served in the Navy in the western Pacific during the Vietnam era and qualified as an officer of the deck. In his professional life, he owned a commercial insurance agency in the Washington, D.C., area and later taught school in Rhode Island.

Dee also began her nautical career early, cruising Rhode Island aboard *Loafer*, the family's 1939 Mathews. While in the harbor in Newport, she and her brother rowed their dinghy over to the presidential yacht and said hello to President Eisenhower.

220-volt power options, quieter generating capabilities and more flexibility in timing equipment usage all directly contribute to lifestyle improvement. As I draft these comments, we have been at a dock without power for 10 days, and the lack of power support has not been a big deal. However, it is time to be back out on the chug. ♦



DEE WILLIAMS (TOP RIGHT), BROOKE WILLIAMS (2)

A GATHERING of Great Harbour trawlers in Everglades City, Florida. *East Passage* in Islesboro, Maine, framed by a vintage windjammer (opposite).