



## Converting 36ft steel

## Cartwright Cutter

Back in July 2016, while motoring down the Richelieu River, our Perkins 4-108 diesel engine completely failed and was not able to be rebuilt. My husband, Dan, and I were devastated but after many hours of researching possible solutions we decided to go the electric/hybrid route. The electric/hybrid system supports our desire to reduce our carbon footprint and even if we wanted to install a new diesel replacement we couldn't since the marina we were stuck at didn't have the capability to install the engine into our boat.

With the decision made we then furiously began researching companies that could re-power s/v Minke with an electric/hybrid system. Luckily, we found a person that had the drive and the will to help us reach our goal. Nancy Frainetti, the owner of The Electric Marina and a dealer for Electric Yacht, began sending emails with the possibilities of what we could do to get Minke up and running again. After a flurry of emails back and forth with Nancy relaying calculations formulated by Scott McMillan, and Mike Gunning at Electric Yacht, we decided to go forward with the QuietTorque™ 20.0 kW, 48 Volt package powered by four Torqeedo Power 26-104 batteries and two 1700W Torqeedo chargers. The calculations were based on the total displacement of our boat (24000 lbs.), the waterline beam (10'6"), length of waterline (29') and an estimation of RPM at different knot speeds when we were running with our Perkins engine.

Setting aside the stress of what we were going to replace the old diesel with, we began tearing the old engine apart piece by piece. Most of the electric/hybrid installation videos that you can watch online show the old engine being whisked away easily from the hull with the use of a crane. Unfortunately, that was not a possibility at our current location so the engine had to be downsized. Most of the smaller pieces were easily removed except for the engine block and transmission which each weighed about 150 lbs. after being completely disassembled. With the use of our Canadian Tire chain fall hoist, we pulled it out of the engine compartment, then with a lot of heavy lifting up the stairs, we carefully slid them out the hatch to the edge of the boat and down a plank into a cart. It was a great feeling once the engine and transmission were removed and thanks to Trans Atlantic Diesels we sold our parts for a few dollars.

The next steps to follow included cleaning the engine compartment with degreaser and repainting it. Metal mounts for the new electric motor were fabricated as well as platforms to mount the batteries. The large wire connections were cut to length terminals were installed, and the Electric Yacht Display and two throttles were mounted. Once the batteries were installed and secured they were connected into a series parallel bank to produce 48 Volts with 208 amp hours. Connections were made from the power relays to the batteries, chargers and fuses were installed and power from the batteries was connected to the motor. Since we needed to produce electricity while we are motoring down the river we bought a 5.5 kW gas generator to use on the deck powering us until got to the Canadian/US border at Rouses Point NY.

After a little over a month of constant work, Dan and I pushed the silver Torqeedo battery button, waited for the red light to blink and then we turned the key. The throttle lever was slid forward and the propeller shaft began to rotate. After such a long wait the cobwebs between Minke and the dock were ripped away, we had power once again and the sweet hum of the motor was music to our ears.

After finally making it across the border Minke was hauled out in NY at Gaines Marina. During the two weeks on the hard we installed an Ultra Compact Marine 5.5 kW Next-Gen diesel generator, change out our propeller to a new Michigan Wheel DJX 18inch diameter 15 pitch and repainted Minke's underside so she was ready for the push down to FL. We were under way heading South through Lake Champlain to the Hudson river. We noticed Minke moves so much better than with her old Campbell Sailor prop 18 inch by 11inch pitch. We can reach hull speed and maneuvering at slow speed has improved so much! One of my favorite improvements is that the Electric drive makes close quarters handling so much simpler. We have even been able to back into docks which was not possible before. With the old Perkins diesel, we had a separate throttle and transmission lever for forward and reverse. I always felt like I needed 3 arms to operate the levers and wheel when coming into a dock. With the new system, we can easily transition between forward and reverse with the use of one simple lever plus we do not have to worry about harming a transmission if we need to quickly put the throttle in reverse.

Motoring south through Lake Champlain we decided to collect data on the output of the electric motor and we noticed that with the new prop the motor was not reaching the recommended RPM's and amp draw that would operate most efficiently. We contacted Scott and Nancy and without hesitation, they shipped a set of pulleys and belts to better match the motors to the Prop. When we arrived at Catskill, NY to re-step our mast, the pulleys and belts were waiting for us. Switching the pulleys and belts was simple and only took about an hour. With our mast raised and the QT20 motor now at a better ratio it was time to get moving south one again.

We had read that our propeller would be able to regenerate power while we were sailing but since we are a slow boat I was not expecting too much to come from this. I think that the choice of our lithium batteries and their voltage has made it less likely that we will get much regeneration from the propeller unless the bank voltage is low. While sailing through the Chesapeake Bay we saw regeneration from the Propeller. Our Torqeedo battery bank when fully charged has a voltage of 58.2V. I noticed regeneration from the prop when the batteries were about 52V. When sailing at around 5Kts the state of charge meter displays the motor turning between 500 and 550 rpm. Input amps to the batteries was around 1.5A but we did see up to 7 amps for a short period when we had a few gusts that pushed us up above 6Kts but most of the time it is in the 1.5Amp range (I have included a chart with some data on the speed and amp draw).

After 3 months of daily use we have been extremely satisfied with our purchase. We were not planning to re-power but the benefits from our electric propulsion system have been numerous. I would also like to state that the customer service that we have received has exceeded our expectations and we are so happy to have found such a great crew to support us through this re-powering process.

Below are some photos that were taken and our journey on Minke can be followed at:

[www.theodysseyofminke.blogspot.com](http://www.theodysseyofminke.blogspot.com)

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Hoisted the old Perkins 4-108 out of Minke.



Engine compartment painted and ready for the electric system.



Motor mounts fabricated and installed.



New Electric Yacht motor ready to be powered up.



Throttle installed.



Torquedo batteries installed.



5.5kW generator installed in the stern of Minke.

New propeller installed.

