

# The Electric Conversion:

*The problem was familiar to a host of boaters – a 30 year old Atomic-4 engine that was noisy, smelly, and clearly needed a very major and expensive overhaul. Inevitably the question comes down to the age-old: “Do you fix or replace that cranky old motor?”*

*Lorne Spence*

Repairing the Atomic 4 will buy some time, but old gas and diesel engines are notoriously unreliable, and become increasingly expensive to repair as time goes on.

Enough is enough, said an exasperated Ian Wilson, as he contemplated the bills from yet another rebuild. Surely, there’s a better way. That’s when the light dawned. Ian had bought the boat, Initram, with his son John, a keen environmentalist who works at Bullfrog Power Inc., an ecologically minded electricity provider.

At this point it seemed simple. Why fix a 30 year old engine for the umpteenth time, John asked, when he could leap into the future and install a far more practical, cleaner and more efficient electric motor? Thus started a long and fascinating voyage that transformed the Wilson’s C&C 35 from noisy and unreliable gas power into a smooth and efficient electric.

Electric motors have been around even longer their internal combustion counterparts. Both types have their strengths and weaknesses, but the main drawback of electric power has been cost. It simply never made financial sense to put an electric motor in a boat. All of that has changed in recent years as



Lorne Spence removing Atomic-4 motor from Initram. TOP - Electric motor display panel

new technology has increased the efficiency of electric motors, while the cost of both motors and batteries has started to drop.

The first step was to find the electric motor. A quick search on the internet found Electric Yacht of Minneapolis (<http://www.electricyacht.com>) and its two experts, Scott McMillan, company owner, and Bill Tomlinson, the head of sales. The website features stories of other boaters who have taken the plunge and retrofitted an electric motor in their sailboat, as well as

some video clips of these boats in operation. These, along with the advice of Scott and Bill, were enough to convince the Wilsons they were making the right decision.

After several weeks of talking with Scott from Electric Yacht, John settled on a 9 kW brushless electric motor, equivalent to 12 hp, that he was assured would have enough power for his needs. Because electric motors have no power-robbing gearbox, almost all the energy the motor generates is transferred to the propeller. This means that a 12 hp





Battery bank complete, with wiring and fusing

electric has roughly the same amount of power as a 15-18 hp diesel. The Wilsons then started asking around, trying to find a boat mechanic who would take on the project. "Most of them were less than interested," said John, "but then we found Lorne Spence at Genco Marine Ltd. in Toronto, who was keen to make this new challenge work." Lorne, a certified Marine Electronics Technician, would find this a different sort of job than the electronics installations that are his daily norm. They made a great team, an innovative boat-owner who was keen to experiment with electric power and a young electronics expert who was bubbling with good ideas.

The motor came with almost everything he needed, including the controller, instruments and throttle. The only missing parts were the batteries, battery cables and charging system. With Lorne's advice, John chose four ultra-modern Odyssey AGM batteries. "They just seemed like a great fit," said Lorne, "we needed a high quality battery that wasn't going to bankrupt the project." At 132 pounds each, they seem imposing, but with the weight savings from removing the fuel tank and the engine, the electric system actually weighs about 20 lbs less than the Atomic-4 and a full tank of gas. And, as a bonus, the batteries fit comfortably in the space where the fuel tank used to be, with much the same weight distribution. A custom made mahogany plywood box holds them securely in place.

Finding a charger for a battery system like the one in Initram was a challenge in it's own right. Lorne sourced two different chargers that would get the job done, and the Wilsons decided on the one made by Analytic Systems, a Canadian company that makes military-grade products. At a cost of just over \$2,000 it was an expensive charger, but as Spence stated, "Being able to charge the batteries in a timely fashion was key to this project. The Analytic charger could deliver more than 20 amps at 48 volts. We couldn't find another charger that could do that reliably time and time again. The military

spec also meant it was ruggedized for the tough marine environment."

It took Lorne and the Wilsons about a day to disassemble the Atomic-4 and prepare it for removal. With the help of Paul Horne from QCYC, they used the mast crane to lift the motor out. Unfortunately, what was left behind was a real mess. Years of oil, exhaust and fumes had left its mark on the engine compartment. John and his wife Leigh got their hands dirty and scrubbed it clean, and then Ian made it look new again with a fresh coat of paint. Once that was done, it was time to fit the

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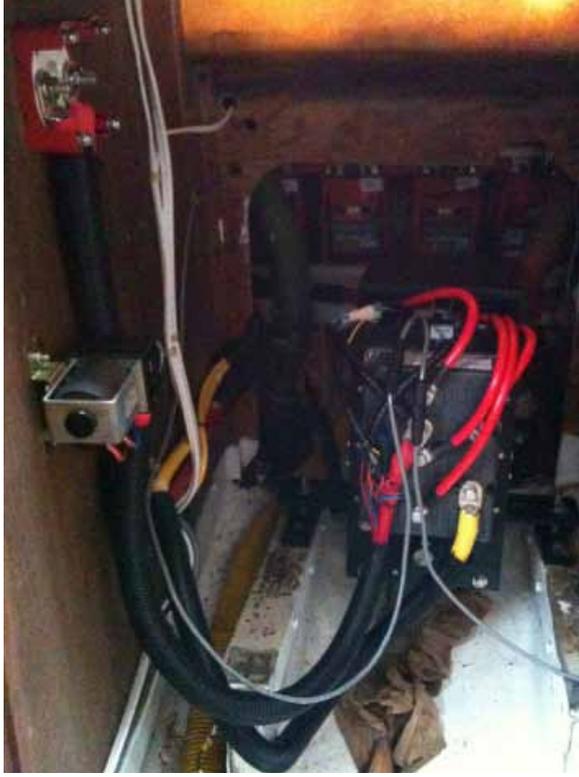
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L to R: Motor in Engine bay 90% complete with cover off. Engine bay painted, battery shelf installed with 2 batteries in Analytic battery charger installed. Next page L to R: Throttle/shifter control installed on binnacle, John (L) and Ian Wilson at the helm of Initram, first cruise with the electric motor - John Wilson standing on Initram's deck at QCYC

engine. The mounts from the old Atomic-4 were inspected and judged safe to use. The motor from Electric Yacht has a unique mounting design that made installation a breeze, including the crucial step of motor/propshaft alignment. Running the heavy 2/0 AWG battery cable was more challenging. The batteries were run in a series layout, meaning the motor had 48 volts available to it. As its peak current draw is nearly 200 amps, proper wire layout was vital. Some minor steps remained, including the mounting of the throttle control and the engine status panel. Lorne removed the old Atomic-4 cable throttle/shifter system and mounted the new electric version in its place. The old engine display was removed and covered with a sheet of fresh starboard and the new display was mounted on top. Some quick tests followed, and soon Initram was ready to go.

The big moment had arrived. John took the helm and guided his boat out for a trial run. It was a revelation. "We simply pushed the control lever backwards and Initram reversed out

of her slip, quietly, with the simple hum of the electric motor," John said. "Out on the water, we moved into forward and took her up to five knots with all systems looking great. It worked a charm, and far better than we expected."

Initram motored around Toronto harbour for 45 minutes, so quietly that at full throttle they didn't have to raise their voices to talk. "It was such a different experience," Lorne recalled. "You could actually hear people on other sailboats yelling to each other over the sound of their motor." Ian was able to talk to his son in a normal voice for the first time, without yelling over the noisy gasoline engine. And there was no smell, no exhaust and no pollution.

The setup on Initram allows her a range of roughly 32 nautical miles. "Most boaters want to keep their internal combustion engines because they're worried about the range they'll get on an electric. But most sailors aren't more than 20 miles from home at a given time unless they're doing distance cruising, and even then Initram has enough range

to get you to a port if you run into trouble." The motor was powerful enough to handle 10-foot waves without trouble, as John found out on one blustery day off Port Credit. Full throttle resulted in a little over six knots, which gives two hours of run time. 50% throttle gave nearly four knots and six hours of run time. That's more than adequate for getting out of the dock, for coming home on a calm day, or reaching safety in an emergency.

"The majority of sailors don't run their motor for more than 15 minutes, enough time to get out of the slip and get the sails up. And when we return home, we just plug in the battery charger overnight and it's ready for another fun trip in the morning," mused John.

The Wilsons plan on adding solar panels and a wind generator to increase their range as well, one of the benefits of battery power. For those who are a little more conservative, carrying a generator would increase their range indefinitely. But then the inevitable question: How much did it all cost?



The new 12 hp brushless motor was \$4,995, and the batteries and charger totaled \$4,800. At just under \$10,000 the electric system is about 15% more than a new 12 hp Volvo motor. The cost of installation is pretty much the same for either, around \$4,500.

The crucial difference however is maintenance. The electric motor needs no oil changes, no fill-ups; virtually no maintenance

whatsoever. The Odyssey batteries will give 500+ cycles before they need replacing, and that means years of hassle-free boating. Plus, the best part is that the motor will generate power when you're under sail.

That's right, sailing will actually charge the batteries.

So the next time you see a sailboat gliding silently through the water with its sails furled, don't worry. It's

not magic, it's just electric.

*Lorne Spence is an ABYC and NMEA-certified Marine Electronics Technician.*

*For questions you can contact Lorne at Genco Marine Ltd. - Toronto and Port Credit at [www.gencomarine.com](http://www.gencomarine.com)*



Just a brief comment from Electric Yacht:

We are thrilled with this story and the positive comments that are directed toward our company and our products.

The 48V charger selected for this installation is truly a beautiful and high-test piece of equipment, however, it is on the pricey side.

We can provide 48V chargers that are suitable for less than \$500. I only point this out because it does impact the overall comparison of electric vs. diesel.

Congratulations on an installation-well-done go to Lorne and to John and Ian as well.

Note also that we will be delighted to provide a custom Performance Projection for your very own boat, or one you may be looking at.

Just send your boat's builder, LOA, year built, displacement, LWL, and and a brief description of your usage patterns to [info@electricyacht.com](mailto:info@electricyacht.com).

We will send you Projections in about a week.

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