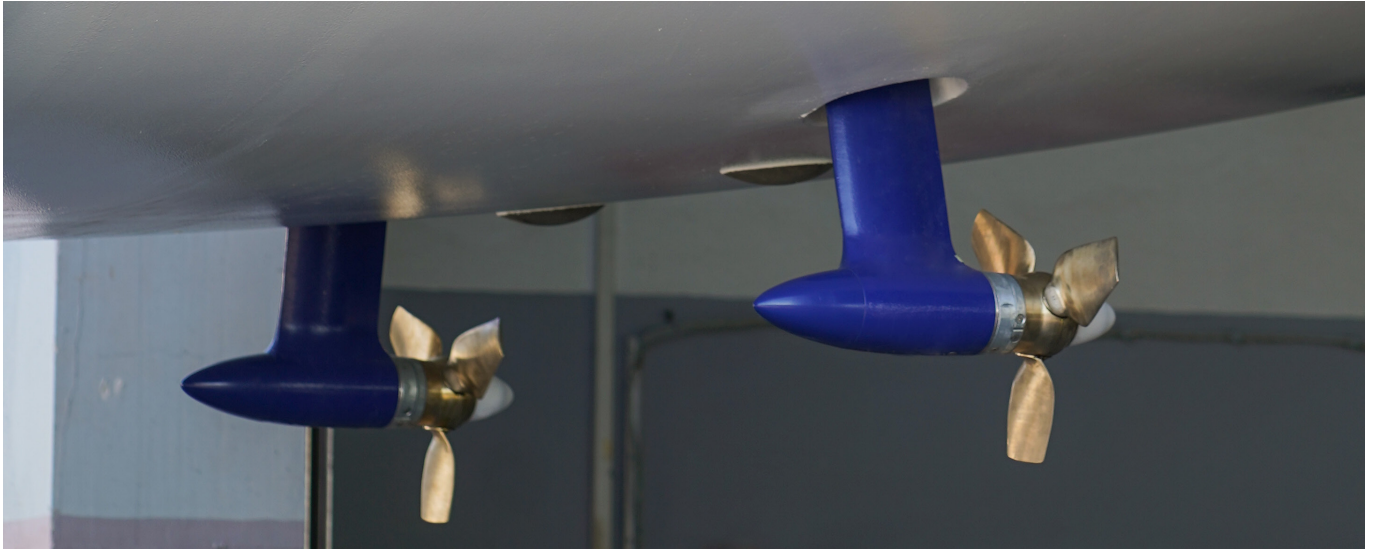




CAN TWO MOTORS BE BETTER THAN ONE?



Twin motor system installations have been around in multihulls for decades but not until recently have they become popular as an alternative in monohulls as well.

In 2020, the first production monohulls with twin electric motors were produced. The first twin hybrid electric monohull was a 2020 Arcona 465 delivered to a private buyer in the UK. The first pure electric monohull with twin motors (2 x ServoProp 10) was a 2021 Salona S460 built in Croatia, delivered early 2021 to the United States.

According to the owner of the brand new Salona S460, not only was the S460 a joy to sail as they cracked 10 knots of boat speed, but the twin motors were incredible in many ways. Here are a few benefits of the twin motor system.

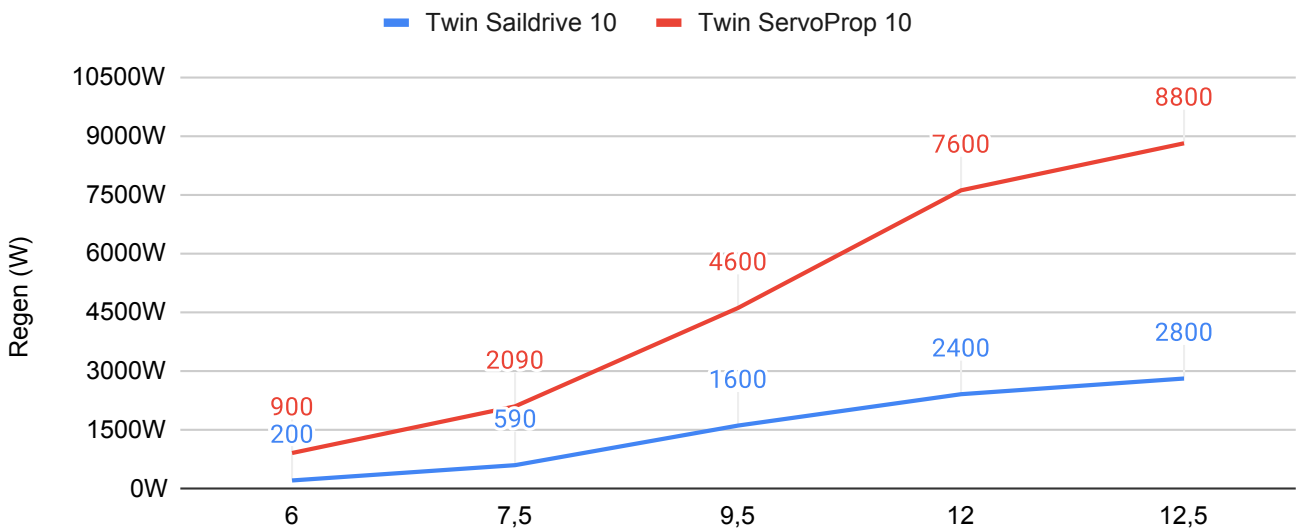




Additional hydrogeneration

First, with two motors, the hydrogeneration doubles. This cuts in half the time it takes to regenerate energy while sailing. Instead of sailing 4-5 hours to regenerate an hour of motoring on a single motor, twin electric motors can regenerate an hour of motoring in 2-3 hours. The motors can easily regenerate 400 to 1100 W each depending on the boat speed. And, since the two motors are outboard to the keel instead of centered behind it, the water stream past each motor is not obstructed.

Hydrogeneration Estimate for Twin Saildrive 10 & Twin ServoProp 10



Improved manouverability

Second, the maneuvering in marinas is significantly easier. Twin electric motors will make the bow thruster the equivalent of the landline phone.

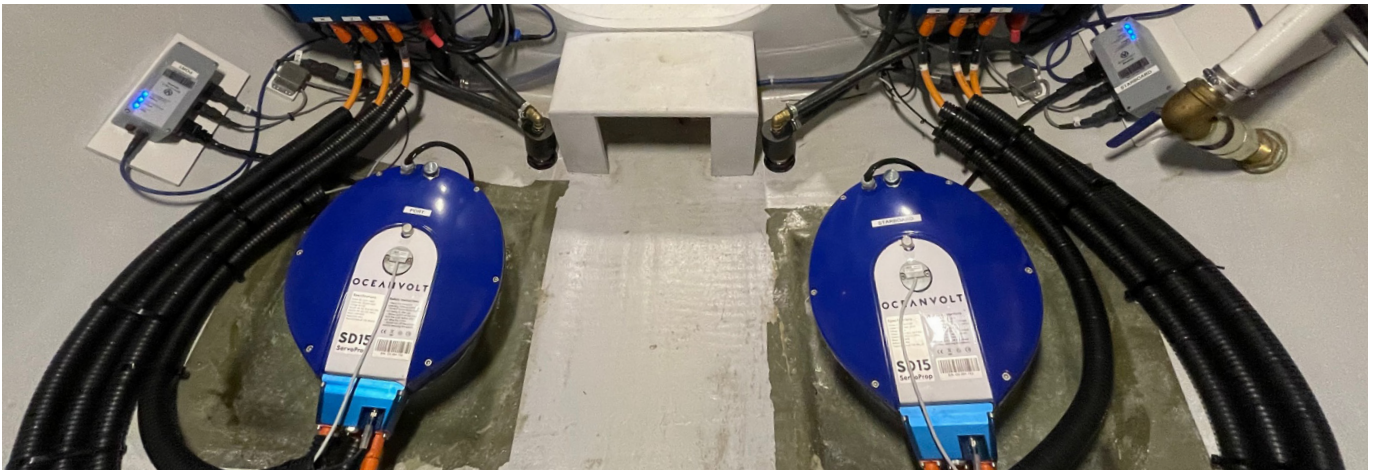
"I docked the Salona S460 in ~20 knots of wind. I wasn't sure I could do it. In hindsight, I could have gone stern first down the slipway and used my momentum to back into the slip and maybe been okay. But I went bow first down the slipway and without the twin electric motors, I most certainly would have crashed into other boats as I went past the slip, stopped, reversed and turned my stern into the slip fighting a 20 knot wind on my beam." "If I had tried to do that maneuver in my sailboat that has a single engine, I would have crashed for sure."

With twin electric motors, just like on a twin screw in a catamaran or a powerboat, you can use forward and reverse to steer. In fact, on a monohull sailboat, which pivots around the keel, the turning is better than any catamaran or powerboat. By putting the port motor in reverse and the starboard motor in forward, one can pivot on a dime in a monohull with a keel.



Redundancy

The third value of twin electric motors is redundancy. Electric motors don't usually require more than 30 minutes of annual maintenance and they last so long (over 100,000 hours) that hours on the motor aren't even tracked. Thus, it is unlikely you would need redundancy with an electric motor. But, every sailor knows how important redundancy of all boat systems is for safety and peace of mind, so that if something breaks or gets damaged, you have a backup. With a twin electric motor, if one somehow got damaged or breaks, you have a backup. No sailboat with a diesel engine has an option for redundancy like this.



More power, still at safe 48V

Fact: Two separate 10kW motors have more combined thrust than a single 20kW motor. So equipping a boat with two 48V electric motors instead of one will give you all the aforementioned benefits and also additional thrust to get you quickly going if needed.

The single most important thing affecting safety on board is the voltage the system is designed around. Voltage divides electric propulsion systems for boats into two categories. Low voltage systems, meaning systems designed to operate below 50V and high voltage systems, designed to operate usually above 230V. A low voltage system makes owning a product simple and safe, as you as the owner, are allowed to install or troubleshoot issues that may arise. A simple \$20 voltage meter is the only tool you would need. If you need help, any electrician can be of assistance anywhere in the world.

In the OECD countries – you have laws and regulations that govern how and who is able to do electrical work. Anyone is allowed to do electrical installations in low voltage systems. However, when you move into High Voltage the game changes totally.

You need to be a certified electrician who is allowed to work with High Voltage. Add a boat and this becomes a marine environment and an electrician will need to have both High Voltage qualifications and a permit to be able to work in a marine environment.



Complete power management and modern comforts onboard

The power generated by twin motors can be used to power both the propulsion system as well as all the electronics on board without the need to have a separate generator. Complete power management, not just propulsion: AC, lights, winches, fridge, oven, microwave, coffee maker, charging electronics, navigation etc. With this in mind we can definitely start talking about the possibility of a totally self-sufficient cruiser!

Because of the complexity of a typical vessel's systems there are typically no options that function as a full vessel power management. Also because of all the different fuel and storage systems there is no way to move potential power from one place to another. For example diesel fuel cannot be used to cook, and only through a wasteful engine running process can it be converted to direct current and stored in batteries, then either an inverter or a separate genset is required to provide alternating current. These incompatibilities go on, with each requiring acquisition and storage of unique fuel. There are separate monitoring systems that can all be clustered together but still require multiple points where decisions have to be made and miscalculations cause loss of function.

With a properly designed electric system the whole vessel's power system can be monitored and the power reservoir can service all draws. This system uses the large 48vdc propulsion battery bank as the primary reservoir which can be replenished from shore power, hydro-regeneration, solar power, wind power and an onboard generator. This large reservoir can feed out to propulsion, 12/24vdc loads through converters or to charge additional supplemental batteries where high draws are present. It also can feed out through inverters to all the AC draws on board, which can now remove many additional systems and associated systems by using electric for everything that needs propane or CNG (Compressed natural gas) fuel.

Once the vessel's systems are designed with the new paradigms in place there are many advantages. Because the power is now all coming from the same place and the power can be auto-generated or supplied from dock power the vessel's capabilities are greatly increased. For example a vessel sailing in a steady trade wind can run air conditioning all the way across the ocean, and cook five course meals because the power is coming from the water being sailed through. Also there are no issues of compatibility for gas tanks or bad fuel in foreign ports.

Also because the power reservoir can be filled in so many different ways, a properly designed vessel can be completely independent. The end user can have all the information they need to make power management decisions for the entire vessel instead of having fuel or power for one draw but not being able to use it for other needs.

Most electric propulsion systems store historical data so the assumptions about power use can be monitored and checked against actual use. The monitoring system (in Oceanvolt's case RSI) also allows the system to warn owners and techs when batteries are running low or other system errors occur.



Hydrogeneration to reduce weather helm

When sailing upwind one normally needs to hold the wheel/helm to keep the boat sailing at the preferred angle to the wind. When you have two motors on board this can be solved by turning one motor slightly on and the other one on hydrogeneration.

Let's say the wind is coming from the port side at a 30 degree angle. If you switch on the port side motor to hydrogenerate (creating minor drag) and the starboard side motor just slightly on (200-300rpm), the boat will stay in it's course since the motor that was switched on will counter the wind while the other motor is actually generating energy. This is something you could never do on a monohull installed with just one motor.



If you enjoyed this whitepaper please look forward to these topics, where we hope to get much more in depth on some of the subjects we've just touched on here.

- Lithium Battery Chemistries: Value and Advantages
- Hydrogeneration
- Motorsailing
- System Design
- Optimizing Range
- Cruising with Pure Electric
- Cruising with a Hybrid Electric
- Docking and Handling