



## **Small evaluation on our sailing plans and to use the hybrid system.**

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### **Overall vision**

To build a boat that does not have any limitations can be a safe comfortable home without any connection to civilization for a period minimum up to 3-4 months.  
We'll like to avoid Gas for normal gas stove and ordinary gasoline for outboards etc. To use renewable energy as much as possible.

### **Sailing plans**

We are a family of 5, Me my wife, Inge, and our 3 kids Emelina 8, Isabella 14 and Andreas 15 years old. My background is as electrical engineer and I have in the past 15 years run an international company making automation systems. Now I have the opportunity to work remote due to my position as a board member.

All the family, except Emelina but will come soon, are certified divers, Inge and me as technical divers. That's why a diving compressor is on board. 😊

Inge started to sail when she met me and as a sailboat sailor her experience is not longer than 3 years. I've been sailing from kid first fishing together with my dad later waterskiing and as Skipper on diving boats for longer trips. Today we are both having a Commercial sailing license.

Our plan is to start a longer journey as soon hull #23 will be ready. We will start at least 2 months together hopefully departing Cherbourg not later than 1/7-19. ☺ First plan is to go south to the Mediterranean, after 2 months the girls have to go back to Denmark and Andreas and I will continue. From there we have no plans other than we will enjoy life, we have talked about to cross the Atlantic, or maybe "only" to Canarias for the winter season Azores west of Scotland and back to Denmark. Summer 2020 Isabella will hopefully join and Andreas has to go back to university. From here we are not sure maybe Svalbard maybe we will still be in the Caribbean. We'll see, but 2 years mostly on the boat. Inge and the kids will join as much as they can.

After that, we don't know maybe we'll just stay in the Nordic countries for a shorter period.

Why the boat name Anemis. AN for Andreas, EM for Emelina, IS for Isabella. The most important and valuable in our lives.

We have decided to have the vision; we'll not have a plan but enjoy where we are.

## **Short description of why Hybrid, why Garcia and why OceanVolt.**

Today we have a Tesla and A Nissan Leaf both electrical so about running on batteries are well known to us.

We like to go sailing, and if we could do motor sailing in a quiet manner, without burning any fossil fuel, it will be a very nice environment friendly solution.

We have together with Garcia Yachting and OceanVolt made an agreement for a hybrid propulsive solution on our new Exploration 45 hull #23 to be delivered not later than 30/06-2019.

Garcia was selected after a research among the few go anywhere exploration boats. Shallow draft, safe boat with watertight bulkheads, redundancy for all important things and much more. See specifications elsewhere to be convinced yourself.

OceanVolt AXC line have been chosen due to there system is build up with modular 48Vdc 10kW unites that can be built together and run as a single unit or electrical separated in case of a failure.

The good thing about 48Vdc is that it is touchable in case of any fail connection to the boat.

The same with Valence batteries a proven source of storing electricity. Built on Valence's patented Lithium Iron Magnesium Phosphate chemistry platform.

A pack of 2x8 batteries 1,75kW each connected to on BMS.

Available power  $2 \times 8 \times 1,75 = 28\text{kW}$  usable 80% = 22,4kW

Calculated power need for maintaining 5-6 kn = 6,9 kw = 3,2 hour = 19 nm range

If speed reduced to <5kn = 3,5 kw = 6,4 hours= 30 nm range

If needed maximum speed will be 9kn = but only for 30 min, the genset will start automatic if more than 80% power on the engine are used more than 10sek. so technical more.

Genset 15kw 48Vdc direct mounted to the battery bank.

When sailing 5-6 kn there will be an overcapacity to fully charge the batteries and give the genset a break.

When the sailing speed on sail will be above 5 kn the engine will be able to regenerate power up to 1kw at 7 kn. Means in an Atlantic crossing there will be full batteries all the time.

We have also solar and wind generator.

If the batteries are getting low approaching a narrow pass it is just a matter of slowing down to allow the generator to fully charge the batteries before entering a narrow pass. It is all about knowing what we're doing.

On anchor we'll have 22 kw available to cooking, washing machine, water maker dive compressor ect.

The limitation will, like in the most houses, be that we can't make water same time we're filling dive tanks.

Calculated use will be 10kW compare to a normal use in a family house at 5kW. There will generated energy from Solar and wind so the genset have to run for 1 hour every 3<sup>rd</sup> day maximum.

All inverters/chargers will be at the 48vdc system and 2 to 3 dc/dc charger will charge the service batteries that can be reduced to 2x100ah.

I really do not see any limitations why not go greener, but only see the opportunities.

## **Different scenarios**

Motor failure  
Battery failure  
Genset failure

Motor failure, due to the modular system it will be possible either by myself or via a web connection to Garcia/OceanVolt to reprogram the system to run on the working units.

Battery failure, same as the engine. Batteries are built up modular and can be manipulated via programming to set out a faulty battery. In case of very high loss of battery power it will be possible to run on the generator as long as some of the batteries are able to work as a capacitor for 48vdc.

Genset failure, will reduce the opportunity to motorsail for a longer distance but anyway it will be possible to charge batteries via regeneration when sailing or via solar or wind or at shore power.

## **Conclusion**

For me this is the right way to look for a future exploration boat. Silent sailing to explore, no need to fill up gas bottles, no need to have gasoline on board for an outboard, if an electrical engine will be sufficient to cover the need.

Long sailing on a very low consumption, no need to use diesel at all if we'll go to a harbor every evening or travel from one anchor to another.

The only limitation will be to go on highspeed on engine for a longer period, with my sailing experience it will never be a limitation we still have 30 min on full power.

## **Parts included**

- AGT 15000 Fisher Panda genset, modified by OceanVolt for use in this application.  
15kW 48Vdc
- Valence single battery bank 28kWh package split in 2 sets @14kWh connected to one BMS system.
- OceanVolt AXC30 kW with 2 control levers and displays. Equal to a 75HP diesel
- Victron charger/inverter 2X5kW
- 48vdc/12vdc charger for service batteries. 3X400W.
- Solar panels 520W 4X12V=48Vdc
- Silentwind wind generator 500W 48Vdc
- Victron color display for monitoring