Many happy returns

Green Orca®
The world’s leading lithium-polymer energy system from EST-Floattech

Powered by EST-Floattech
“A cleaner shipping industry brings together our love of water, our passion for technology, and our worldview. We developed the lithium polymer battery using the knowledge and expertise we had gained in the luxury-yacht building industry and electrical engineering. In it we saw the potential to satisfy the demands of both economics and sustainability.

Thanks to our innovative energy storage systems, vessels become more environmentally friendly and consume less energy without compromising on power, comfort or safety. We specifically opted for battery cells using EST battery technology, which generate stable and safe energy. Not only for the shipping industry, our cells are also used in mission-critical environments such as those found in the aviation and aerospace industries. They are also used on land too, often under extreme conditions, such as on a United Nations peacekeeping mission, where our batteries power an energy storage system in the desert heat.

We believe that if a job’s worth doing, it’s worth doing well. As engineers, we know all too well that a good battery system can only generate optimum yield if the communication between all systems on board is coordinated integrally. As far as charging is concerned, this happens automatically, quickly and safely using engines, generators or the grid, but ideally with sources of renewable energy. After all, not only does our planet provide us with clean power, it needs us to use it too.”

The EST Floattech team
In thousands of cities, nature reserves and remote areas, ferries large and small, cross waterways to take people to their destinations day and night according to fixed schedules. With environmental requirements for these vessels becoming ever stricter, the challenge is to reduce their impact on air quality, the climate and water quality, and to reduce their energy consumption.

**Economy and the environment can go hand in hand**

Worldwide, EST Floattech serves ferry operators with clean, silent, powerful energy systems based on lithium polymer batteries. The environmental gains are great: NOx and CO2 emissions reduced to little to nothing, and offensive odours and noise pollution are also diminished for the crew, passengers, the natural world and those living, working and recreating in and near the berth.

**Intelligent solutions**

Our lithium polymer batteries are used in fully electric urban ferries. For ferries travelling longer distances, we implement safe and robust hybrid solutions. At the moments that would otherwise generate the most pollution, such as when entering and leaving marinas, and when berthing and unberthing, a full or partial switch can be automatically made to energy from our battery systems. Savings, reduced emissions and increased comfort are the direct result. Many happy returns for everyone!
Intelligent ECO power for ferries

- CO2 and NOx reduction
- Zero emissions
- Engine power
- Cost saving
- Safety
- Comfort

Fuel saving up to 100%
Smaller engine or full electric
Connect to renewable energy
No smell
No noise
Single cell control

Performance:
Output from 40 kW to 8 MW
7.15 kg/kWh power/weight ratio

Lofoten, 11:05 AM
Reducing NO\textsubscript{X} and CO\textsubscript{2}

All over the world, ports, regions and countries are committing to improving air quality and reducing water pollution and the negative impact on the climate. The need for cleaner shipping cannot be ignored any longer. The international MARPOL Convention of the IMO is already prescribing tighter standards for the next few years, the number of Emission Control Areas is increasing, and on a local level there is increasing regulation governing the carbon footprint.

Clean and economic
The energy generated by our smart and powerful lithium polymer battery systems is a clean and economic alternative. The batteries are charged simply and quickly using sustainable and clean solar, wind, tide and geothermal energy. Once the engines are running at their most economic, the batteries can also be charged conventionally by the engines.

Future proof
Running vessels on hybrid energy systems results in a large to very large reduction in NO\textsubscript{X} and CO\textsubscript{2} emissions, depending on the chosen solution. Furthermore, you will be prepared for the stricter regulations that are becoming commonplace in increasingly more regions both now and in the future, and you may also become eligible for certain subsidy programmes.

Advantages
- Reduced NO\textsubscript{X} and CO\textsubscript{2} emissions.
- Charging using all natural energy sources.
- Ready for stricter regulations now and in the future.
- Higher residual value.
- Possibly eligible for subsidy programmes, depending on country and region.

100% RECYCLABLE
CO\textsubscript{2} + NO\textsubscript{X} REDUCTION
UP TO 100%
Energy-efficient, cost-efficient

Every journey has peaks and troughs when it comes to energy consumption. For example, extra power is needed when entering and leaving marinas and when berthing and unberthing. The correct configuration of our lithium polymer batteries makes peak shaving possible, whereby peak demand is provided by the batteries rather than the existing engines or generators. The result is a significant saving in fuel and maintenance, as well as reduced investments in (often excessively) heavy-duty engines, as they no longer need to cope with peaks in energy demand. Furthermore, a more efficient and consistent use of engines means they last longer.

Charged quickly, everywhere
Charging is possible at any time, in any place; at sea, when the engines are running at their most efficient, or while the ferry is on the quay, via a cable or even induction, with no connection necessary. Charging is quick: up to 1 megawatt (MW) in six minutes.

Advantages
- Peak shaving: high engine power achieved with smaller engines.
- Less consumption, lower fuel costs.
- Savings on maintenance costs.
- Fast and efficient charging.
- Charging at sea at the most efficient rotational speed.
- Long battery life.

Long life
The intelligent batteries function in all conditions and have an extremely long life of up to 20 years, depending on the number of cycles and the C-rate. The built-in active battery management system constantly measures the values and performance of each cell and ensures that all individual cells are actively kept at the same voltage level. The result is an increase in the life of the cells, and in turn the batteries. As part of this, active balancing gives real-time insight into the performance of individual cells and battery systems.
Full engine power

Low weight, small volume
Our battery systems achieve the optimum balance between weight and volume. The special cells can store up to 240Ah per cell. The result is savings on weight and space and great improvements in the performance and speed of the vessels. With regard to the traditional lead-acid battery systems, the gains in weight and space can reach up to 75%. It’s no coincidence that our cells are used in fighter jets and even in the Solar Impulse, the first aeroplane in the world to be fully powered by solar energy.

Active balancing
Thanks to the intelligent active balancing system, it is not necessary to fully charge the batteries, because the battery cells automatically compensate each other. This system makes redundant the familiar discharging and charging cycle characteristic of many battery systems.

Intelligent peak shaving
The size of traditional vessel engines is largely determined by incidental power peaks, but the clean energy of our batteries is an excellent way to approach these peaks. As a result, the same power can be achieved with smaller engines.

Advantages
- Batteries provide for peak demand instead of engines (peak shaving).
- Optimum energy distribution at all times thanks to active balancing.
- Regular discharge and charging cycle made redundant (active balancing).
- High power, small volume, low weight.
Crews and passengers want a comfortable and safe crossing, and the constant smart monitoring of the status, energy level and temperature of the batteries ensures just that.

**Lloyd’s, DNV-GL, IEC 62619 & IEC 62620**

Our batteries are Lloyd’s certified, and were tested in 2017 conform the latest DNV-GL standards and IEC 62619 & IEC 62620, which will not only apply to our batteries, but to the system as a whole, including the battery control unit (BCU). That means the entire system will have been certified, and therefore complies the system with the latest safety standards. The spring loaded system of internal connections, rather than screws and bolts, is maintenance-free and vibration-proof, and the batteries’ robust housing is waterproof, in accordance with IP67.

**Pro-active safety system**

If, under very exceptional circumstances, an individual cell were to unexpectedly exceed the permissible values, the battery management system will interfere to pro-actively shut down the relevant string, shutting down the battery before it starts functioning beyond its critical values. During the shutdown, the other battery strings of course remain available to generate engine power.

**Remote monitoring**

It is also possible to connect the battery system to our remote active monitoring service. We will then monitor the performance of your system, and will contact you in the unlikely event of a critical error. In addition, we can advise you on your energy consumption and will take preventative action in that respect if the data we receive gives us reason to do so. That saves you time and money.

**Comfortable**

While the batteries are in use, the crew and passengers are spared from offensive odours and noise, making work and travel more pleasant and healthy. In addition, those living and working near to the vessel will be less disturbed by emissions.

**Advantages**

- Lloyd’s certified.
- Pro-active control of status, energy level and temperature at individual cell level.
- Remote active monitoring service.
- Waterproof housing (IP67).
- Practically unaffected by vibrations, for example.
- No engine noise, offensive odours or particulate matter.
System integration
In our eyes, an optimally performing system is about more than battery technology alone. Our background in electrical engineering and roots in the maritime sector mean we truly understand the importance of the proper and robust integration of all technical systems on board. A seamless fit between our systems and the rest of the systems on board is crucial if you are to safely and efficiently gain maximum return from your investment. Our hybrid solutions are custom-made.

Together with our customers and their partners, such as system integrators, we seek the most economic and sustainable energy systems for clean shipping. If required, we can even engineer and realise the entire powertrain. We ensure all the necessary power, including intelligent 24/7 performance monitoring.

Lithium polymer batteries
Our lithium polymer battery systems score excellently when it comes to the balance between weight and volume. The special cells can store up to 200A (ampere) per cell. With regard to the traditional lead-acid battery systems, the gains in weight and space can reach up to 75%.

Peak shaving
Every journey has peaks and valleys when it comes to energy consumption. For example, extra power is needed when entering and leaving marinas and when berthing and unberthing. The correct configuration of our lithium polymer batteries makes peak shaving possible, whereby peak demand is provided by the batteries rather than the existing engines or generators.

Technical information

• Only one generator is active
• No cold start for second generator
• Battery support for total silence at night
• Peak shaving to reduce fuel consumption and generator maintenance
• Rapid & high current response of the energy storage system is required for peak shaving.

Active balancing
Thanks to the smart active balancing system, it is not necessary to fully charge the batteries, because the battery cells automatically compensate each other. This system makes redundant the familiar discharging and charging cycle characteristic of many battery systems.
• Optimum energy distribution at all times thanks to active balancing.
• Real time active balancing per cell
• Each EST module contains 7 or 14 large cells, depending on the module type
• Each cell has a solo chemical process, therefore an advanced balancing system is required
• Each cell automatically receives a unique address via a NMEA 2000 based EST-CanBus system
• The system monitors cell voltage, SOC, SOH, cell temperatures and all safety features per cell
• When unbalanced, the system transfers energy from the highest cell to the lowest cell with an accuracy of 0.005 Volts in milliseconds.

Per module, EST uses a state-of-the-art, real-time active balancing and monitoring board developed in-house.

Active module series balancing
• Active balancing per serial system during charging, discharging or standby
• Up to 18 battery modules connected in a serial configuration
• Balancing between modules is required for serial higher voltage systems.

Battery control unit
Our battery control unit interferes to pro-actively shut down the relevant string of batteries, if one of the individual cells exceeds its permissible values, shutting down the battery before it starts functioning beyond its critical values. During the shutdown, the other battery strings of course remain available to generate engine power.

Certification
• Lloyd's-certified batteries
• In 2017 the whole battery power system is tested comform the latest DNV-GL standards and IEC 62619 & IEC 62620
• Waterproof housing, in accordance with IP67.

Green Orca 620 Marine Lithium Polymer batteries
• 505 x 540 x 240 mm (H x D x W)
• Lloyd’s certified
• 26 Volt, 240Ah
• 6.2kWh at 47.5 kg.
• 240A/1C nominal charge, Ø23 ±3°C
• 300A/1½C nominal discharge, Ø23 ±3°C
• 720A/3C maximum discharge, >10 sec., >50% SOC
• Stack up to Megawatts and 1,000 Vdc
• Unique BMS with advanced active cell balancing
• NMEA 2000 based CanBus communication
• Designed for marine application, IP65
• Warranty 5,000 cycles at 80% DOD or 10 years
• No electrical or mechanical maintenance

Green Orca 525 Marine Lithium Polymer batteries
• 505 x 540 x 325 mm (H x D x W)
• Lloyd’s certified
• 52 Volt, 100Ah
• 5.25kWh at 47.5 kg.
• 300A/3C nominal charge, Ø23 ±3°C
• 600A/6C maximum discharge, >10 sec., >50% SOC
• Stack up to Megawatts and 1,000 Vdc
• Unique BMS with advanced active cell balancing
• NMEA 2000 based CanBus communication
• Designed for marine application, IP65
• Warranty 5,000 cycles at 80% DOD or 10 years
• No electrical or mechanical maintenance

Green Orca 1050 Marine Lithium Polymer batteries
• 505 x 540 x 325 mm (H x D x W)
• Lloyd’s certified
• 52 Volt, 200Ah
• 10.5kWh at 75 kg.
• 200A/1C nominal charge, Ø23 ±3°C
• 600A/3C maximum discharge, >10 sec., >50% SOC
• Stack up to Megawatts and 1,000 Vdc
• Unique BMS with advanced active cell balancing
• NMEA 2000 based CanBus communication
• Designed for marine application, IP65
• Warranty 5,000 cycles at 80% DOD or 10 years
• No electrical or mechanical maintenance
EST Floattech was established in 2009. Since 2014 it has been part of an investment fund affiliated with one of the largest family companies in the Netherlands, safeguarding the continuity of our company and our sustainable and economic battery systems.