



Eclectic Energy Limited

Guidance on Upgrade from Lead Acid to lithium-Ion Batteries

Many yachtsmen are taking advantage of advances in battery technology and decide to install lithium-ion batteries in place of lead acid as their old batteries require replacement.

The benefits of Lithium-ion batteries include higher energy storage density, reduced weight, faster charge times and increased service life.

Eclectic customers frequently seek advice on connecting existing charge sources such as wind or water generators to their new batteries. Very often the new lithium installation will include a dedicated battery management system (BMS), designed to protect the batteries from both excessive discharge (low voltage cut off), and over voltage (overcharging) cut off. Typically, the manufacturers specify that any charge source must be connected to the batteries via the BMS.

This produces a problem for rotating machines such as wind and water generators, because if the BMS acts, they become open circuit, i.e. the alternator is no longer connected to a load. Without a load in the circuit the alternator is no longer doing any work and the air blades will overspeed by a factor of 2.5 making the machine noisy and threatening in operation.

We recommend that Eclectic generators are installed together with a dump type charge regulator, and these regulators have two core functions.

Firstly, they prevent overvoltage at the battery (overcharging), by terminating the charge once the battery is full. Secondly, once the charge is terminated, they connect the generator to a dump load (power resistor) in order to control the rotor speed and prevent over speeding.

To summarise, when switching to lithium batteries, the existing dump regulator does need to be retained and incorporated into the new system together with the BMS unit. As the BMS can open circuit the generator, a strategy using the dump regulator is required to safeguard the system.

Fortunately, the 6TB regulators usually supplied by Eclectic, feature an inbuilt charge splitter i.e. they have two power outputs so are capable of charging two independent battery banks simultaneously.

One strategy which has been used with success takes advantage of the charge splitter function of the 6TB by connecting one output to the lithium batteries via the BMS unit and the second output to a retained lead acid battery i.e. the engine cranking battery, windless battery or similar.

This arrangement leaves the wind or water generator still connected to a battery when and if the lithium BMS unit disconnects. The 6TB regulator will continue to function normally and provide protection against over speeding.

The size and capacity of the lead acid battery used does not matter, and in normal operation an engine cranking battery will rapidly attain full charge after which the charge splitter will pass all power to the lithium service bank.

The TriStar type regulator supplied for 48v systems does not feature an inbuilt charge splitter therefore this strategy will not work. This limits its use to 12 and 24V systems.