



Why Buy Li-Ion?

Lithium Ion battery technology represents the first significant step forward in battery storage since the development of lead acid batteries.

Most personal devices from phones to laptops, toys to power tools, all make use of the significant advantages Li-Ion offers.

So what are the advantages of Marine and Mobile Li-Ion batteries compared to traditional lead acid (Flooded, AGM or GEL) batteries?

- **Size:** With greater energy density than lead acid technologies Li-Ion batteries are around 1/3 of the physical size of lead acid, while also having more usable energy.
- **Weight:** Greater energy density also means that Li-Ion weighs around 1/3 of the weight of traditional lead acid batteries for a given a/hr rating.
- **More Usable Energy:** Unlike lead acid batteries which ideally are not discharged below 50%, Li-Ion allows you to discharge the battery to 80% DOD (depth of discharge) without affecting the cycle life of the battery.
- **Greater Cycle Life:** Li-Ion batteries are designed to offer 2000- 3000 cycles to 80%DOD. This compares to around 300-500 cycles for a lead acid battery (depending on quality) to only 50% DOD. This equates to between 5 to 9 times more energy available from a Li-Ion battery compared to a lead acid battery of the same capacity rating. – Only achievable with suitably designed BMS / Cell Balancer
- **Faster Recharge:** Li-Ion accepts considerably more charge current for longer than lead acid technologies. Thus it is possible to recharge a Li-Ion battery from 80% DOD to fully charged in one hour with a suitable charging system, as opposed to lead acid technologies which take 7-8 hours from 50% DOD irrespective of the charging system. – Only achievable with suitably designed BMS / Cell Balancer
- **Lower Life Cost:** While Li-Ion batteries are more expensive to initially purchase than lead acid batteries, they have a greater cycle life and thus the amount of energy they can deliver through their life (3000 cycles for Juice Pro Series batteries to 80% DOD) makes them less expensive per amp hour of energy than any lead acid battery. . – Only achievable with suitably designed BMS / Cell Balancer
- **Voltage Stability:** Li-Ion technology also provides greater voltage stability. Even under very large loads terminal voltage remains higher and does not collapse like lead acid battery types. This make the technology very good in applications with short high current loads such as inverters, winches or engine starting applications.
- **High Terminal Voltage:** Along with good voltage stability, Li-Ion also has a higher terminal voltage than lead acid batteries making loads run more efficiently and drawing less current. Nominal voltage on a Li-Ion battery in a 12V system is 13.2V (4 cells at 3.3V each) compared to 12V (6 cells at 2V each) on a lead acid battery. 24V systems use a 24V Li-Ion battery rated nominally at 26.4V.

Do all Li-Ion batteries offer these advantages?

No they don't!

While Li-Ion cells have the ability to offer all of the above advantages, a number of these advantages can only be achieved if the cells are managed and balanced with a suitable BMS (battery management system) and cell balancer that is designed for the application they are used in.



There are many Li-Ion cells in the market that are offered without any BMS or cell balancing. While these batteries will simply not provide all the advantages Li-Ion technology can offer they also do not comply with the Australian / New Zealand Electrical Installation Standards (AS/NZS 3004.2:2014). Furthermore most reputable Li-Ion cell manufacturers will not even warranty their cells without a suitably designed BMS and cell balancer!



So what do Juice Professional Series Li-Ion offer?

Juice Pro Series Li-Ion batteries use one of the highest quality, and most widely used Li-Ion cells in the market place and we couple this with a BMS and cell balancer that is locally designed in collaboration with Auckland University Department of Electrical Engineering for use in marine, solar and industrial applications.

The integrated BMS monitors the battery state of charge and in the event of over discharge provides a warning and then eventually dis-engage the battery (this can be manually overridden in energy critical situations). The BMS also monitors the charging side of the battery and in the event of a charger or alternator issue, which could damage the battery, will dis-engage the charging source until the issue is corrected.

Juice Pro Series batteries are unique in that they control the charge source and load completely independently of one another which will prevent unintentional black ship occurrences.

Aside from monitoring just the load and charge on the battery, the Juice BMS is continually monitoring the battery cell temperatures and voltages to ensure they are operating to their potential. The BMS is the part of the system that ensures the batteries are not damaged through misuse, thus protecting your battery investment.

Juice Pro Series cell balancing uses bi-direction active balancing technology that allows the cells to balance during both the charge and discharge cycles and thus maintains the rated capacity of the battery. This differs to low cost passive balancers which burn off excess energy and in fact reduce the amount of energy the battery can actually deliver. Coupled with this superior cell balancing technology the Juice bi-directional cell balancer also has the ability to parallel multiple batteries for larger capacity battery banks. This is only achievable with active balancing and allows the installation of larger battery banks to be constructed from smaller battery blocks. Thus multiple 200 a/hr batteries can be installed in parallel to creates banks for 400 a/hrs, 600 a/hrs etc.

The Pro Series BMS also incorporates series balancing to allow multiple batteries to be connected in series for higher voltage battery banks such as 46V or 72V.

Both the BMS and Cell Balancer are integrated into each battery to provide one tidy battery package. They then communicate the battery or battery banks state of charge to the Juice Pro Series Display which displays battery voltage, current, % capacity, time remaining and any messages from the battery. All battery programming for setup and optional features are programmed simply through this display.

To ensure that the system is always operating as it should each battery performs a number of self-tests on initial start-up or by selecting the self-test feature on the Display. The self-test checks the correct operation of the battery load contactor, charger relays, and the internal components in both the BMS and Cell Balancer.

Finally Juice Pro Series batteries have been designed to meet both local regulatory standards, as well as international safety standards.

Juice Pro Series cells and batteries meet:

IEC 62660 Safety Standard

EN 61000.6.1 Immunity Testing

EN 61000.6.3 Emissions Testing

UN 38.3 Transportation standards

AS/NZS 3004.2:2014 Marine Electrical Standards

CE European Conformity

Juice Pro Series Li-Ion batteries are the ultimate solution for energy storage either aboard your vessel or in your motorhome.

Enertec Marine Ltd

5G Miro Place, Albany, Auckland, New Zealand

P. +64 9 414 4730, F. +64 9 414 4731, E. info@enertec.net.nz, W. www.enertecmarine.com