



A pair of batteries wired in parallel will increase available capacity

# How to BOLSTER YOUR BATTERY BANK

Need more electrical power? Duncan Kent explains the pros and cons of adding an extra battery to your service bank

**W**ith more and more electrical gear going on board the modern cruising yacht there comes a time when the battery bank needs expanding to cope with the rising energy demands.

It's still quite common for new boats to come with a small engine start battery and an equally minimal capacity service battery – the sort of thing that will only just run a small fridge for 24 hours before it will need recharging. Add to this the occasional use of an electric anchor windlass, lighting,

## ABOUT THE AUTHOR

Duncan Kent has been sailing for more than 40 years and has spent much of that time testing yachts and marine equipment, as well as compiling technical reports for the nautical media.



navigation instruments and an autopilot and you'll be needing to run the engine every six hours or so.

Increasing the capacity of your battery bank will allow you to go longer between charges, or to dig deeper into your reserves if necessary, but there is more to consider than just the cost of an extra battery: it's vital to consider the method of charging and whether you need to upgrade your shore power charger, alternator or alternative power generators.

## Understanding capacity

An appropriate time to consider adding another battery is when you're about to replace the existing one. That way you'll be starting afresh with all new batteries, which is always the ideal – an older battery can otherwise drag down a new one as it reaches the end of its life.

Also, when installing a two-battery (or more) domestic bank it makes sense to buy batteries of the same capacity. The Ah rating most commonly indicated on leisure or deep-cycle batteries is called its C20 rating and refers to its theoretical capacity when discharged over a 20-hour period.

Engine start batteries have thinner plates for coping with brief high-current surges and are more commonly rated using their Cold Cranking Amps ability (CCA). These aren't suitable for use in a service bank as they rapidly die if



**BATTERY TYPES**



**Gel battery**

Everyone has their own experiences and theories about what type of battery is best for use in the marine environment. Traditionally, it was big and heavy open flooded lead-acid (FLA) batteries, and many still swear by this simple technology. Benefits are that you can top them up with distilled water easily and test the capacity of each cell using a hydrometer. Heavy weight meant many built their service bank from 6V batteries, which are easier to manhandle. This also means there's less to lose if one cell fails.

The next stage up is sealed lead-acid batteries (SLA), which many prefer for their 'no maintenance' and non-spill qualities, although they can't be charged as vigorously as an open-cell battery due to their ability to only release excess gas pressure in an emergency.



**Deep-cycle AGM battery**

Several decades ago gel batteries were launched, wherein the electrolyte was a solid gel rather than a liquid. Although sealed, maintenance-free and able to provide a greater number of charge/discharge cycles, they had to be charged less vigorously and at a lower voltage than SLAs.

More recently, Absorbed Glass Mat (AGM) batteries have become very popular for boats. Lighter than regular LAs and with their electrolyte absorbed into matting rather than free liquid, they require no maintenance and can be mounted at any angle. They can also accept a higher charge current, thereby taking less time to recharge, and survive a good many more charge/discharge cycles than flooded cells. Finally, they have a lower self-discharge rate, so can



**Lithium-ion battery**

be left without charging for some considerable time.

The latest developments involve lithium-based batteries. Some swear by them in their various guises (Li-ion or LiFePO4 being the most common), but they have to be handled and maintained very carefully. Yes, they are much lighter than any other marine battery and impressive performance figures are claimed, but they are very costly and require a high-tech battery management system to keep them charged and, more importantly, balanced between cells.

One very important thing to note when creating an interconnected service bank is that all the batteries must be of the same type. You can't mix SLA, Gel and AGM and you certainly can't link any of these with any lithium-based battery.

frequently deeply discharged.

The best batteries for domestic use will be labelled 'deep-cycle', which means they'll have thick plates designed to deliver their energy slowly and repeatedly.

**Adding an extra battery**

In a 12V system adding an extra battery is simply a case of mounting it as close as possible to the existing batteries and then connecting in parallel, connecting 'alike' terminals (positive to positive, negative to negative) using large diameter cable (usually 70mm<sup>2</sup> diameter) and properly crimped battery terminals. Unless you have the tools and some hefty cable hanging around I would suggest you measure up and have the cross-links professionally-made. You could buy a crimper (hydraulic ones are undoubtedly the best) and terminals to do it yourself,

but the investment for such a small job will usually be prohibitive.

When connecting two batteries in parallel it's important to note that the output voltage of the bank will remain the same, but your available capacity (Ah) will increase. There is often confusion with amps and amp hours. Put simply, an amp is a measure of current flow, whereas an amp hour is a measure of current flow every hour. So, in theory a 100Ah (C20) battery could provide a 20A current for five hours before becoming flat. It won't actually, for a number of complex reasons, but for simplicity I'll let it stand.

If you were to join the two 12V batteries together in series (positive to negative, taking the output from the second +ve and -ve terminals), then you'd have a 24V output, but no additional capacity. Two 12V/100Ah batteries connected in series

will still provide 100Ah capacity, but at 24V. Some boats use a 24V system for heavy load devices such as windlasses, winches, water makers and big bilge or shower pumps because doubling the voltage halves the current draw for the same power rated device.

**Protection**

Battery banks should always be protected with high-current fuses (c. 200A) on both the positive and negative output terminals, and as close to the terminals as possible, with no power take-offs until after the fuse. Special fuse blocks are available for this purpose, which are designed so that nothing can be connected directly to the battery without going through the fuse. This gives maximum protection against battery short-circuits, which can cause a fire and/or explosion if left unprotected.



**A voltage sensitive relay automatically connects batteries together for charging**



**A monitor can help you maintain healthy battery levels for longer battery life**

**CONSUMPTION AUDIT**

Before you assume you'll need more power when adding electrical gear, why not first carry out a thorough audit of your needs. Often a deep review of the energy requirements on board can reveal possible energy savings that might even make it unnecessary to add extra capacity and the associated increase in charging capability.