

POWER

ONBOARD

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Modern cruisers now have a much greater dependency on a reliable onboard power source than models of previous eras. The plethora of modern appliances, from dishwashers to bread and coffee makers, now standard on many boats even as small as 30 feet, have placed a drain on a boat's capacity to handle the ever increasing energy requirements. Fortunately advances in energy generation have ensured that boat owners can now enjoy all the comforts of home without having to rely on the constant operation of the onboard genset. In this article, we look at the new generation of inverters and inverter charges and their suitability for the marine environment.

AC POWER ABOARD your boat can be provided from three sources. Shore power at the marina, an on board generator or an inverter. With shore power you can usually run any appliances large or small providing the total power consumption is within the rating of the shore connection.

Generators are good for large loads with a continuous power consumption such as air conditioners, hot water heaters, electric cooking, battery chargers, etc. When you have only small loads to run for longer periods or medium to large loads for a short time, then an inverter is more suitable.

For instance if you don't need the aircon on, the cooking is done and you want to watch a movie, running say an 8kVa generator to operate the entertainment system that draws only 150 watts is fuel inefficient, causes glazing of the generator cylinders and increases maintenance costs. An inverter can run this type of load very efficiently and without making any noise.

INVERTERS

Basically an inverter converts 12V or 24V battery power to 240V AC power so that you can operate appliances when away from shore power. This provides most of the conveniences of home so you can run the television, DVD, bread maker, toaster, mobile

phone charger and computer. Larger inverters will run the microwave oven, electric jug, coffee machine and even electric cook top.

The modern inverter is a compact, light weight unit based on switchmode technology and produces clean sine wave power that is as good as or sometimes better than mains power. The voltage and frequency is much more stable than that produced by a generator so a sine wave inverter is the preferred power source on board when running many items of electronic equipment. Most of the major manufacturers have stopped manufacturing modified waveform inverters as these have a rectangular waveform that is not suitable for many modern appliances and can cause erratic operation of some equipment.

Selecting the correct size of inverter is dependent on the total power consumption of the loads that need to be run at the same time.

Inverters are usually rated in watts or VA (volt amps) which equates to multiplying the volts by amps, e.g. a typical two slice toaster uses 4 amps operating on 240V power. Multiply the two together and we have a consumption of 960 watts. Therefore the minimum size inverter required would be 1000 watts to run the toaster only. If you

want to watch TV while making toast for breakfast then you need a 1200 watt or larger inverter. Typical rating required to run some appliances and an entertainment system is about 2000 watts. Some large boats have much larger inverters but the size of the battery bank must also match the inverter and application.

Also to consider is whether the loads will have a high startup surge power requirement. Most inverters have a surge rating of double their continuous rating to cater for loads such as microwave ovens, fridges and television. However many motors have a surge power demand of five times or more of their running power. This may require a larger inverter just to cope with the surge.

If working out the load sounds too complex, there is an online interactive marine system calculator called 'Mcalc' on the Mastervolt website. This free calculator at www.mastervolt.com can help determine your system needs or analyse an existing system.

INVERTER/CHARGERS

These units function as inverters when electricity or generator power is not available and as battery chargers when mains or generator power is available. This



Power to run the TV can come from these modern inverters.



makes really good sense in something like a motorhome or a boat that has access to electrical power only some of the time. An inverter/charger costs much less than a quality inverter and a separate quality battery charger of the same power output.

An inverter/charger has some advantages and some disadvantages over the battery charger and separate inverter combination. First let's look at using a battery charger that is separate from an inverter.

When the batteries are low, you start the generator and switch AC power to the battery charger and battery charging commences. You can still continue to produce power from your battery bank as required via the separate inverter. A sine wave inverter delivers high quality power and the power supply so your load is maintained at this quality which can be an advantage. However you normally need to switch your power points direct to the generator via separate circuits or a changeover switch otherwise the batteries will take longer to recharge.

.When you use an inverter/charger the above need for a changeover switch and associated wiring for the power points is redundant. The process of going from inverter power to generator/mains power at your power points is automatic as this function is provided by

the combi automatically, with a built-in transfer relay. The swap between inverter power and the incoming power is virtually instantaneous. It is quite simple really.

When you have generator/mains power available, this also enables the combi to function as a battery charger.

The whole process is automatic, needs nothing added and is ready to function straight from the box. As generators vary in quality, it is highly recommended to have a delay device so your generator can warm up and stabilize prior to supplying energy. A quality combi will also look at the generator output prior to transfer and match the inverter power so that even sensitive devices like computers will continue to function right through transfer.

There are a few advantages and a few disadvantages associated with this automation. The obvious advantage is that everything is in one box and the purchase price is a lot less than a separate inverter and separate battery charger of the same quality. Your inverter/charger system could have on board electronics to automate starting the generator (if your generator is suited to auto-start) and will be a reliable unit saving space as well as money. A modern inverter/charger will also have electronic sensing to determine the total generator

load and will automatically reduce battery charger output if your demand on the generator is high.

If you use anything but a high quality generator your power quality will suffer. The output power quality from the average generator is inferior to that of a modern inverter and can degrade even further when under load.

Some units offer remote controls with battery monitoring so you can select whether you will be battery charging with the charger part of your combi when using generator power. If the generator is too small to run the charger and other loads, then a 'power share' setting needs to be selected to prevent overloading the generator.

Some typical applications could include when boats are motoring, the 240V refrigeration can be run on the inverter to reduce generator running time. The engine alternators will simultaneously be charging the batteries so there is in fact no net energy loss from the batteries.

On a boat where the generator is run frequently during the day at anchor, it is possible to shut off the generator at night and run a 'silent ship'. All the refrigeration and any appliances run on inverter power overnight and the batteries are recharged when the generator is started to cook breakfast. Adding an inverter or a combi will give you 24 hour power for a vastly reduced generator running time. The savings in fuel and maintenance costs alone could well pay for the installation cost.

If you have mains power connected and it is unreliable or you need a guaranteed continuous supply for lighting, refrigeration or computer systems, an inverter/charger will provide all of this automatically and reliably.

An inverter charger is a device that will be around for a long time.

Next issue we look at battery chargers and battery technology, what size batteries/chargers you need, what type of batteries are best suited to your application and more.

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